Section 6. Data Management Subsystem

6.1   Introduction

The Data Management Subsystem (DMS) provides file ingest, data processing, product formatting, product transfer, resource monitoring, file deletion, and report generation. Also, the DMS handles the external communications with IAS and ECS.

6.2   Design Overview

This section provides an overview of the DMS software design. The relationship between the DMS and other LPGS subsystems is presented, along with a software task model representing the interdependency among DMS software components and a discussion of the assumptions, constraints, and considerations used in the design process.

6.2.1 Subsystem Software Overview

Figure 6-1 contains the context diagram of the DMS. As shown, the DMS interfaces with ECS, IAS, PCS, and the LPGS database. The DMS receives product generation request, product status request, product cancellation request, Level 0R (L0R) product response, and Level 1 (L1) product available response messages from the ECS; the DMS sends the L0R product request, L1 product availability notice, L1 product cancellation acknowledgment, and the L1 product status messages to the ECS. The L0R product and L1 product are transferred to and from the LPGS system via ftp. The DMS receives processing requests and ECS product status messages from the PCS; the DMS sends ECS product requests and the DMS processing status to the PCS. The DMS also interfaces with the PCS via the LPGS database. The DMS sends characterization statistics to the IAS.

The DMS is responsible for interfacing with ECS and IAS, ingesting and processing the L0R product, formatting and transmitting the L1 product, managing the LPGS resources, and generating reports. The PCS subsystem controls the operations of the DMS via the database or socket messages. In addition, the DMS processes operator requests to delete work order files, generate reports, provide the characterization statistics to the IAS, and acknowledge L0R products ingested manually.

The DMS ingest of the L0R product will include sending a request to ECS for the product and receiving a response from ECS after the product has been sent via ftp. After the ingest is completed, PCS notifies DMS that the L0R product needs to be prepared for Level 1 product generation. After the product generation is completed, PCS tells DMS to convert the L1 product into the final format. The PCS notifies the DMS when it is time to transmit the product to ECS. The product transfer will include sending a request to ECS and receiving a response from ECS after the product is sent via ftp. Finally, the DMS system periodically deletes the old products from the LPGS disk and monitors the disk usage.
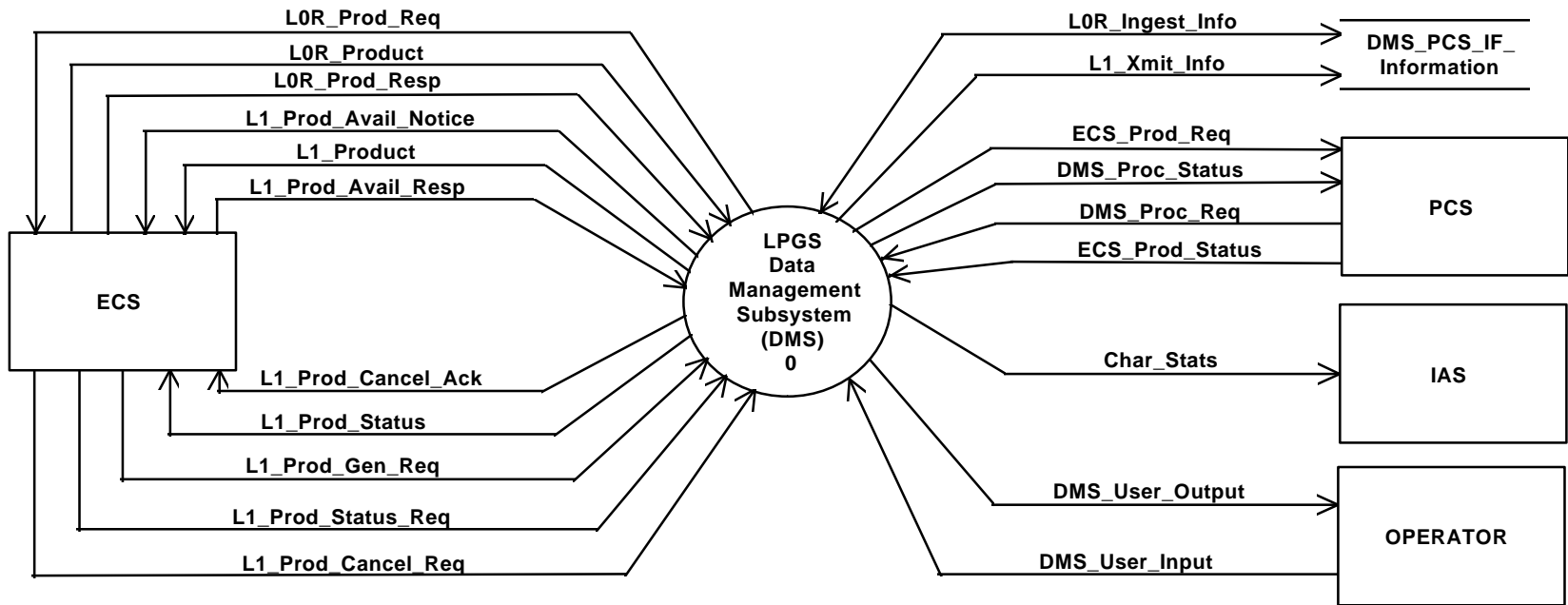
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Figure 6–1. DMS Context Diagram

6.2.2 Design Considerations

This subsection presents the design drivers relevant to the DMS software and the assumptions of the software design.

6.2.2.1 Design Assumptions

The following assumptions were made during the design of the DMS:

- Commercial off-the-shelf (COTS) products will be available for converting the L1 image to Geographic Tag(ged) Image File Format (GeoTIFF) or Fast Argonne System for Transport (FAST) format and for the hierarchical data format (HDF) formatting of the L1 products.

- The DMS task will partially reuse IAS software for the processing of the L0R product and for the resource management task.

- XXX_get_msg and XXX_send_msg routines shown on the structure charts are a generic set of routines used to represent the sending and receiving of data between LPGS subsystems and external elements.

- Indirect interprocess communications between DMS and PCS is through the DMS_PCS_IF_Information data store, which will be part of the database.

- Each work order will have a unique directory that contains three subdirectories: the input, intermediate, and output directory.

- The DMS ingest process will control when the L0R data is requested from ECS (criteria TBD). Thresholds for the ingest process will be configurable by the operator.

- The L0R product is ingested into a temporary directory because of the UNIX definition of file and directory ownership and access rights. A temporary directory allows LPGS to control which directories ECS needs access rights to on the LPGS system. The temporary directory also allows DMS to control which files on the LPGS system are owned by ECS. ECS owns the data ingested onto the LPGS system, and as the owner of the files, ECS can write to the files, delete the files, and change who has access to the files. Once LPGS copies the files from the temporary directory to the input directory, LPGS becomes the owner and controller of the files.

- The L1 product is sent via ftp to ECS from multiple work order output directories.

- The DMS resource manager will only delete work order associated files and directories which have been marked for deletion.

- The work order files and directories are marked for deletion after the data is successfully transferred to ECS.

- The time period between disk cleanups will be configurable by the operator.

6.3　Subsystem Design

This subsection provides a detailed description of the DMS software task model selected to implement the DMS design. The DMS software is designed as a single software configuration item (SWCI) that satisfies all the data management requirements imposed on the LPGS.

The transforms presented in the DMS essential model are grouped into seven independent tasks that execute concurrently. The DMS task model, shown in Figure 6-2, consists of the following tasks: IF with ECS (DIE), Ingest L0R Product (DIL), Process L0R Product (DPL), Format L1 Product (DFL), Xmit L1 Product (DXL), Resource Manager (DRM), and Generate Reports (DGR). The design of each DMS software task consists of a single software component.

The DIE task is responsible for interfacing with ECS. This task receives all of the messages which are sent to and received from ECS. The messages received from ECS are routed to the appropriate LPGS subsystem, and the message received from the LPGS subsystems are routed to ECS. The process controls the transfers, which includes performing the handshaking protocol, throttling the traffic, and ensuring the interfaces are available.

The DIL task is responsible for ingesting the L0R products. This task will periodically send ECS requests for L0R products. After the product is sent via ftp, this task receives notification the product is available. Then, this task stages the L0R data in the appropriate work order directory. Finally, DIL will update the database to indicate the L0R data is available for processing.

The DPL task prepares the L0R data for Level 1 product generation. This task ensure the data quality is appropriate for L1 product generation and generates characterization statistics. Then, this task generate the consensus PCD and MSCD files.

The DFL task converts the L1 product into the final format. This task converts the L1 output products into HDF format. Then, this task converts the L1G product into the specified format (GeoTIFF or FAST). Finally, this task will move the product into the output directory and checks the product for completeness.

The DXL task is responsible for transmitting the L1 products. This task will notify ECS, through the DIE task, that the product is ready for transfer. After the product is sent via ftp, this task receives notification the product was transferred. Next, DXL updates the database to indicate the product was delivered and marks the files associated with the work order for deletion.
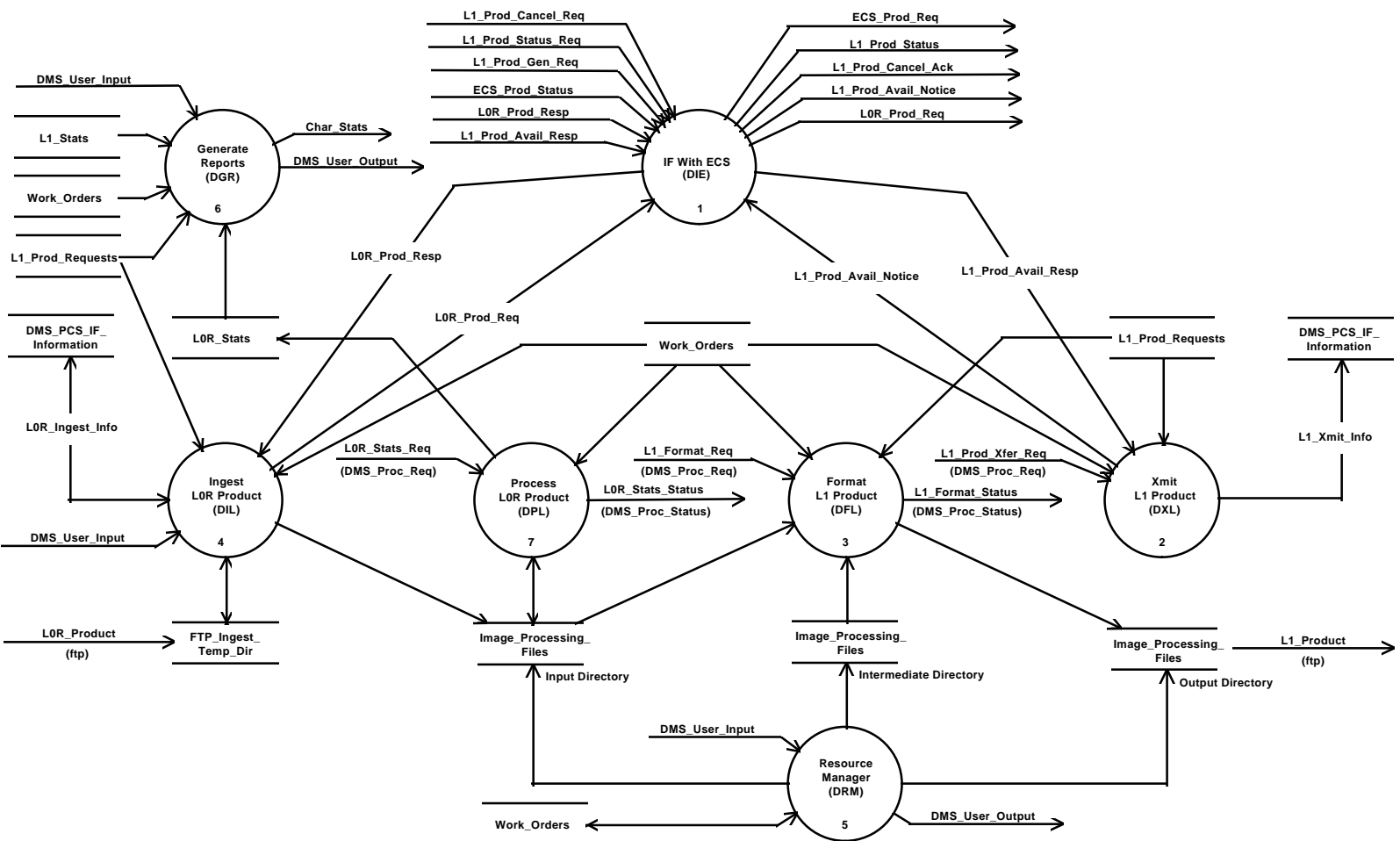
The DRM task is responsible for managing the data associated with the work orders. This task periodically deletes file and directories marked for deletion and reports the disk usage. Also, this task receives and processes operator requests to delete work order files and directories.

The DGR task is responsible for generating reports. This process will provide IAS with the characterization statistics. Also, this task will generate operator requested reports.

The key objective used in the task-level design was to identify the primary services required of the DMS software and to evaluate their implementation as sequential or concurrent

activities relative to each other. The seven tasks (DIE, DIL, DPL, DFL, DXL, DRM, and DGR) were selected as candidates for implementation as concurrent processes.

Generate Reports (DGR) 6
- DMS_User_Input
- L1_Stats
- Work_Orders
- L1_Prod_Requests
- Char_Stats
- DMS_User_Output

IF With ECS (DIE) 1
- L1_Prod_Cancel_Req
- L1_Prod_Status_Req
- L1_Prod_Gen_Req
- ECS_Prod_Status
- L0R_Prod_Resp
- L1_Prod_Avail_Resp
- ECS_Prod_Req
- L1_Prod_Status
- L1_Prod_Cancel_Ack
- L1_Prod_Avail_Notice
- L0R_Prod_Req

L0R_Prod_Resp
L0R_Prod_Req
L1_Prod_Avail_Notice
L1_Prod_Avail_Resp

Work_Orders
L1_Prod_Requests

DMS_PCS_IF_Information
L0R_Ingest_Info
DMS_User_Input
L0R_Product (ftp)

L0R_Stats

Ingest L0R Product (DIL) 4
Process L0R Product (DPL) 7
Format L1 Product (DFL) 3
Xmit L1 Product (DXL) 2

L0R_Stats_Req (DMS_Proc_Req)
L0R_Stats_Status (DMS_Proc_Status)

L1_Format_Req (DMS_Proc_Req)
L1_Format_Status (DMS_Proc_Status)

L1_Prod_Xfer_Req (DMS_Proc_Req)

L1_Xmit_Info
DMS_PCS_IF_Information

FTP_Ingest_Temp_Dir

Image_Processing_Files — Input Directory
Image_Processing_Files — Intermediate Directory
Image_Processing_Files — Output Directory

L1_Product (ftp)

Resource Manager (DRM) 5
- DMS_User_Input
- Work_Orders
- DMS_User_Output

Also, part of the DMS task model are the global data stores that contain information used by tasks for performing the required functions and communicating with other tasks. The DMS software design uses a local COTS database to store and manipulate information about received image files, products, and reports generated from the received input files. The database contains setup and configuration information needed by the DMS to perform its required functions.

The description of each task is presented in the following subsections. This description consist of a task overview, initialization, normal operation, error handling, and design of the task.

6.3.1 DMS IF With ECS (DIE) Task

This subsection describes the DIE task software.

6.3.1.1 Task Overview

The DIE task is responsible for message transfer between LPGS elements and ECS. The architecture has DIE as the single LPGS electronic interface with ECS and a message router to and from to PCS, DIL and DXL. The protocol between DIE and ECS is TBD. Sockets will be used for communications between the LPGS elements.

6.3.1.2 Initialization

This task is started by the LPGS Software Initialization Task and remains memory resident thereafter. DMS configuration parameters are retrieved from the database to set up and initialize the interfaces to ECS, PCS, DXL, and DIL.

6.3.1.3 Normal Operation

DIE periodically checks each interface for incoming traffic. DIE validates and categorizes incoming messages and routes them to the appropriate destination. The ECS_Prod_Req message from ECS (L1_Prod_Cancel_Request, L1_Prod_Gen_Request, or L1_Prod_Status_Request) will be directed to PCS. The ECS_Prod_Status messages from PCS (L1_Prod_Cancel_Ack or L1_Prod_Status) will be directed to ECS. The L0R_Prod_Req from DIL and L1_Prod_Avail_Notice from DXL will be routed to ECS. The ECS messages L0R_Prod_Resp and L1_Prod_Avail_Resp will be directed to DIL and DXL respectively. DIE will keep an event log to record all traffic. DIE monitors the status of all communication channels, reports all errors, and attempts to restore connectivity.

6.3.1.4 Error Handling

The DIE task establishes a signal handler to capture all fatal UNIX signals which would cause the task to abort. The signal handler will send an error message to the operator, disconnect from the database, and gracefully shutdown the task. Nonfatal errors are logged to the LPGS error log and an error notification is sent to the user interface.

6.3.1.5 Design

Figure 6–2. DMS Task Model

This subsection presents the design of the software component that implements the functions of the DIE task. The structure chart for the software is illustrated in Figure 6–3. DIE_Main is the
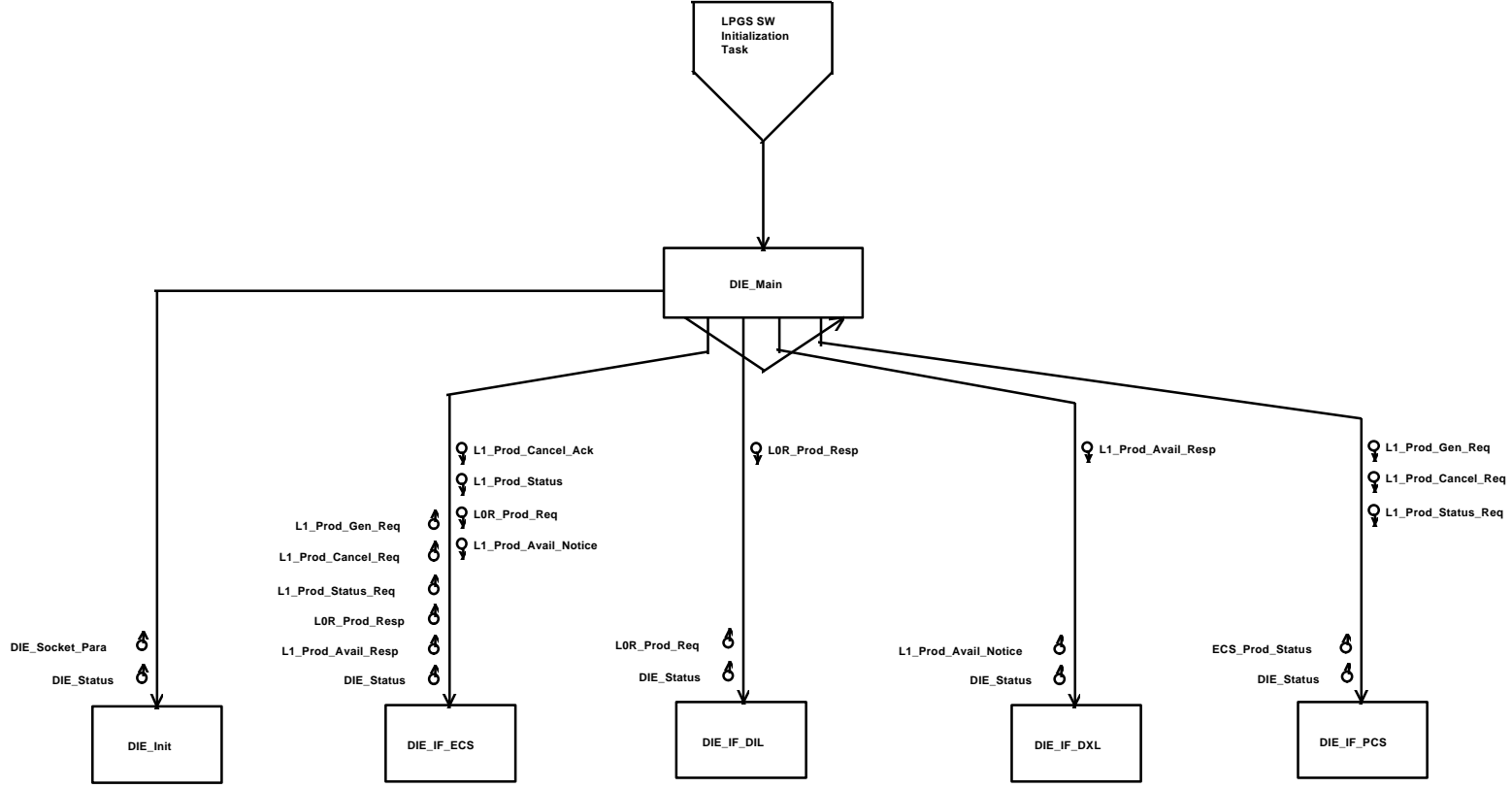
Figure 6–3. DIE Task Design

main routine for the software process. The following sections describe the input, output, and primary modules for the DIE process.

Input

The input to the DIE task includes the following:

Data	Source	Purpose
ECS_Prod_Status	PCS	Message routed to ECS. (L1_Prod_Status or L1_Prod_Cancel_Ack)
L0R_Prod_Req	DIL	Message routed to ECS
L1_Prod_Avail_Notice	DXL	Message routed to ECS
L1_Prod_Cancel_Req	ECS	Message routed to PCS
L1_Prod_Status_Req	ECS	Message routed to PCS
L1_Prod_Gen_Req	ECS	Message routed to PCS
L0R_Prod_Resp	ECS	Message routed to DIL
L1_Prod_Avail_Resp	ECS	Message routed to DXL

Output

The output from the DIE task includes the following:

Data	Destination	Purpose
ECS_Prod_Req	PCS	Message routed from ECS (L1_Prod_Cancel Req, L1_Prod_Status_Req or L1_Prod_Gen_Req)
L0R_Prod_Resp	DIL	Message routed from ECS
L1_Prod_Avail_Resp	DXL	Message routed from ECS
L0R_Prod_Req	ECS	Message routed from DIL
L1_Prod_Status	ECS	Message routed from PCS
L1_Prod_Cancel_Ack	ECS	Message routed from PCS
L1_Prod_Avail_Notice	ECS	Message routed from DXL

Primary Modules

The primary modules for the DIE task include the following:

NAME: DIE_Main

TITLE: Interface to ECS and Dispatch Messages among LPGS Subsystems

BODY: The DIE_Main is invoked by the LPGS Software Initialization Task. It executes the DIE task initialization (DIE_Init) routine, which connects to the database to retrieve DMS communication parameters. Next DIE_Main sets up an infinite loop to service each of the communication channels by calling DIE_IF_ECS, DIE_IF_DIL, DIE_IF_DXL and DIE_IF_PCS. These interface routines validate incoming messages before routing them to their destination.

NAME: DIE_Init

TITLE: Initialize DIE task

BODY: The DIE_Init routine connects to the database and retrieves LPGS configuration information. DIE_Init sets up and initializes each communication channel and creates a signal handler to capture system interrupts.

NAME: DIE_IF_ECS

TITLE: Handle Interface to ECS

BODY: DIE_IF_ECS first checks if there are any outstanding outgoing messages to ECS. If more than one message is pending, DIE_IF_ECS continues to send them until the queue is exhausted. DIE_IF_ECS then detects any pending incoming messages from ECS, validates them, and moves them to the appropriate staging areas to be dispatched. The message handshake mechanism shall follow the LPGS-ECS protocol convention (TBD).

NAME: DIE_IF_DIL

TITLE: Handle Interface to DIL

BODY: DIE_IF_DIL checks if there are any outstanding outgoing messages (e.g., L0R_Prod_Resp) to DIL and proceeds to send all of them. DIE_IF_DIL then detects any incoming messages from DIL (e.g., L0R_Prod_Req), validates them, and moves them to the queue for ECS output. The message handshake mechanism shall follow the DIE-DIL protocol.

NAME: DIE_IF_DXL

TITLE: Handle Interface to DXL

BODY: DIE_IF_DXL checks for the existence of outstanding outgoing messages (e.g., L1_Prod_Avail_Resp) to DXL and proceeds to send all of them. It then detects any incoming messages from DXL (e.g., L1_Prod_Avail_Notice), validates them, and moves them to the queue for ECS output. The message handshake mechanism shall follow the DIE-DXL protocol.

NAME: DIE_IF_PCS

TITLE: Handle Interface to PCS

BODY: DIE_IF_PCS checks if there are any outstanding outgoing messages (e.g., L1_Prod_Cancel_Req) to PCS. It sends them until the queue is exhausted. DIE_IF_PCS then detects any incoming messages from PCS, validates them, and moves them to the queue for ECS output. The message handshake mechanism shall follow the DIE-PCS protocol convention.

6.3.2 DMS Ingest L0R Product (DIL) Task

This subsection describes the DIL task software.

6.3.2.1 Task Overview

This task is responsible for ingesting Level-0 Image products from the ECS. The criteria used by this task for requesting L0R products from ECS may include disk space availability, prestaging of data for processing, and throttling to prevent overloading ECS. The task is started by the LPGS Software Initialization task and runs continuously. It activates based on a timer expiration, receipt of a protocol message (L0R_Prod_Resp), or receipt of a user request. Image data is transferred into a single Ingest Temporary directory and therefore only one Ingest request to ECS is active at any time. When a L0R_Prod_Resp is received: the task checks the Ingest temporary directory for correct and consistent image data; moves the image data to the appropriate work order input directory; and catalogs the data into the database. When a operator request is received: the task checks the work order input directory for correct and consistent image data; and catalogs the data into the database.

6.3.2.2 Initialization

The task is started by the LPGS S/W Initialization Task and accesses initialization data from the database for configuration.

6.3.2.3 Normal Operation

Since ingest is through a single temporary directory, only one L0 product is ingested at a time. The process will wait for a L0R_Prod_Resp after issuing a request for data (L0R_Prod_Req) before determining whether to continue requesting additional L0Rs. When not waiting for a L0R_Prod_Resp, this process will periodically wake up and determine whether criteria are met for ingesting additional Level 0 products. When waiting for a L0R_Prod_Resp, this process will periodically wake up and determine whether a wait threshold value has been reached. If the threshold is met, this process generates an error and updates the database to reflect transfer timeout. Also, this task will receive requests to catalog L0R products the operator has manually ingested into the work order input directory.

6.3.2.4 Error Handling

The DIL task establishes a signal handler to capture all fatal UNIX signals which would cause the task to abort. The signal handler will send an error message to the operator, disconnect from the database, and gracefully shutdown the task. Nonfatal errors are logged to the LPGS error log and an error notification is sent to the user interface.

6.3.2.5 Design

This subsection presents the design of the software component that implements the functions of the DIL task. The structure chart for the software is illustrated in Figure 6–4. DIL_Main is the main routine for the software process. The following sections describe the input, output, and primary modules for the DIL process.
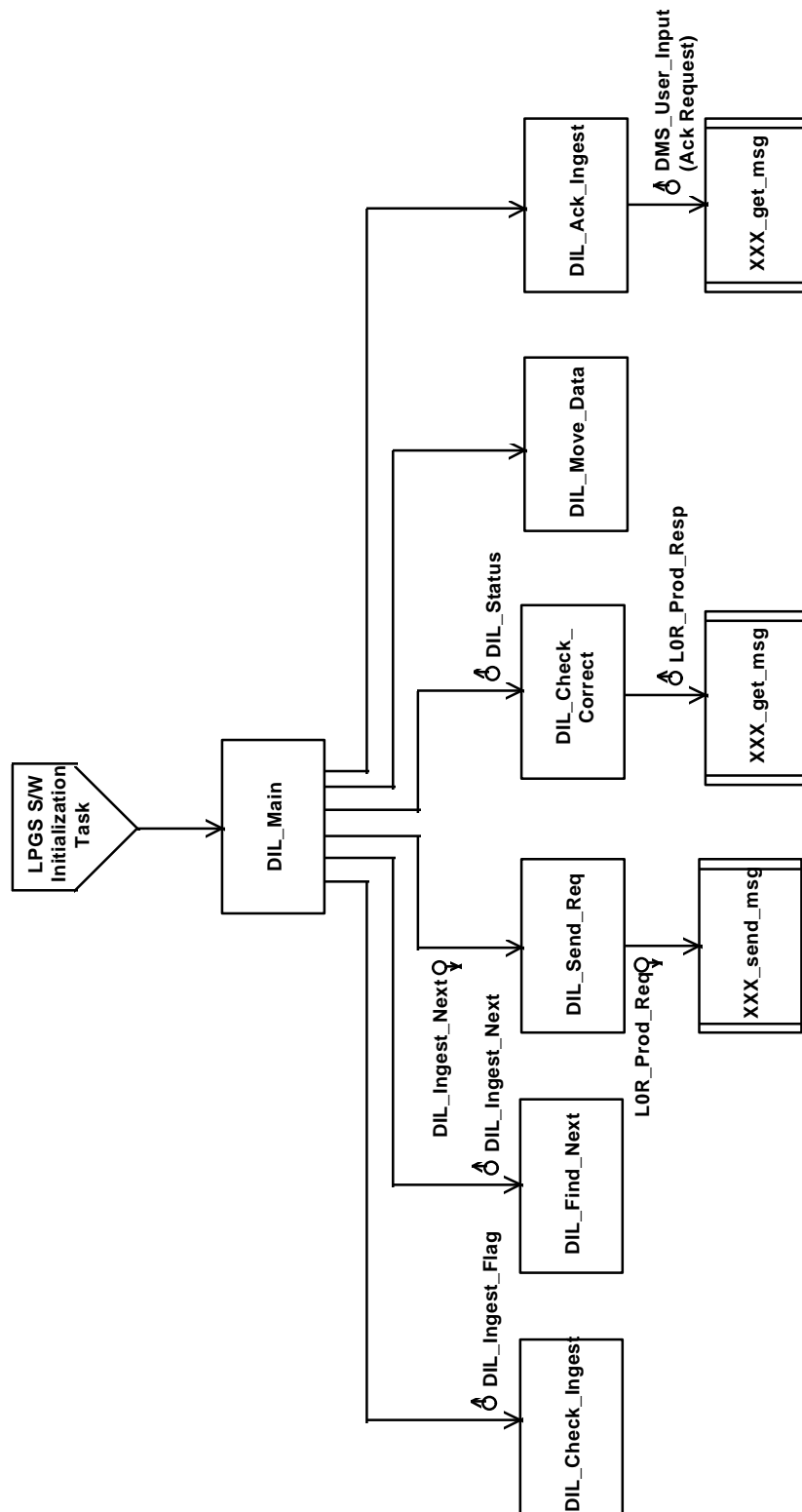
Figure 6–4. DIL Task Design

Input

The input to the DIL task includes the following:

Data	Source	Purpose
L0R_Ingest_Info	DMS_PCS_IF_Information Data Store	Ingest control information
L0R_Prod_Resp	DIE	Response from ECS after the L0R_Product has been transferred to LPGS
DMS_User_Input	Operator	Acknowledge operator ingested data

Output

The output from the DIL task includes the following:

Data	Destination	Purpose
L0R_Ingest_Info	DMS_PCS_IF_Information Data Store	Ingest status information
L0R_Prod_Req	DIE	Request for Level 0 data product sent to ECS

Primary Modules

The primary modules for the DIL task include the following:

NAME: DIL_Main

TITLE: Main Ingest Process

BODY: This unit accesses the configuration information in the database and configures the task. A timer is set to activate the task, and the task processes the SELECT. If there is not a request for data pending when the timer expires, DIL_Check_Ingest is called to decide if the criteria to ingest another Image product have been reached. Once the ingest criteria are met, DIL_Find_Next and DIL_Send_Req are called in sequence. When a L0R_Prod_Resp is received, DIL_Check_Correct and DIL_Move_Data are called sequentially to complete the process. If the task times out on the receipt of the L0R_Prod_Resp, an error is generated.

NAME: DIL_Check_Ingest

TITLE: Check to see if ingest criteria have been met

BODY: This unit checks to see whether criteria to request Image Data from ECS have been met. The criteria may include: disk space availability; need to pre-stage image data for processing; and need to prevent overloading ECS bandwith. It returns a flag indicating whether the criteria have been met or not.

NAME: DIL_Find_Next

TITLE: Find Next Level-0 Product to be ingested

BODY: This unit accesses the database to determine the next L0R product to be requested from ECS. Normally this would be image data from the oldest WO in the system that has not already had its data ingested. The operator has the ability to override this

scheme by placing a selected WO as the next-in-line. The identified WO is passed back to DIL_MAIN.

NAME: DIL_Send_Req

TITLE: Send Level-0 Product Request

BODY: This unit accesses the DMS_PCS_IF_Information data store and the Work_Orders information to build the L0R_Prod_Req to specify the level 0 data files needed. The L0R_Prod_Req is sent to DIE for transfer to ECS. The database is updated to reflect the WO data has been requested.

NAME: DIL_Check_Correct

TITLE: Check Image data in Ingest Temp Directory

BODY: The Ingest Temporary Directory data is examined for correctness and consistency. Checks include verifying that the correct number of files are present, the data coincide with the L0R_Product_Req information, etc.

NAME: DIL_Move_Data

TITLE: Move data and update Database

BODY: This unit accesses the DMS_PCS_IF_Information data store and the Work_Orders information to determine the desired location for the image data and moves the image data to that directory. Then, this unit catalogs the L0R products files in the database. Also, the database is updated to reflect that the data is available. Finally, this unit clears the Ingest Temporary Directory.

NAME: DIL_Ack_Ingest

TITLE: Acknowledge receipt of operator ingested data

BODY: This unit receives the operator request to acknowledge the receipt of L0R data on LPGS. This unit will check the data in the WO input directory to verify the correct data is present. Then, this unit catalogs the L0R products files in the database. Also, the database is updated to reflect that the data is available.

6.3.3 DMS Process L0R Product (DPL) Task

This subsection describes the DPL task software.

6.3.3.1 Task Overview

The DPL task, which runs under the control of a script initiated by PCS, preprocesses the L0R image files. This task will check the files and data for completeness and the ability to generate Level-1 products (i.e., check that the level of missing data does not exceed a threshold value). Next, DPL will generate the consensus PCD and MSCD files. This task will update the database with the results of the processing. This task returns a status to the PCS work order controller and exits.

6.3.3.2 Initialization

The DPL task is started by the PCS Work Order Controller Task. This task retrieves initialization data from the database for configuration. It is activated to process the L0R product after the data is received from LPGS.

6.3.3.3 Normal Operation

This task runs when started by PCS. It processes the image data, updates various stores, and returns status.

6.3.3.4 Error Handling

The DPL task establishes a signal handler to capture all fatal UNIX signals which would cause the task to abort. The signal handler will send an error message to the operator, disconnect from the database, and gracefully shut down the task. Nonfatal errors are logged to the LPGS error log and an error notification is sent to the user interface.

6.3.3.5 Design

This subsection presents the design of the software component that implements the functions of the DPL task. The structure chart for the software is illustrated in Figure 6–5. DPL_Main is the main routine for the software process. The following sections describe the input, output, and primary modules for the DPL process.

Input

The input to the DPL task includes the following:

Data	Source	Purpose
L0R_Stats_Req	PCS	Parameters defining image to be processed

Output

The output from the DPL task includes the following:

Data	Destination	Purpose
L0R_Stats_Status	PCS	Results of process

Primary Modules

The primary modules for the DPL task include the following:

NAME: DPL_Main

TITLE: Main Process

BODY: This unit calls a sequence of routines in order: first it calls DPL_Init to initialize the task based on information passed to the task and information in the database; DPL_CheckL0RData is called to check the files to ensure that processing criteria are met; DPL_PerformQCStats generates trending data; DPL_GenConsensusData for PCD and MSCD. Status is returned when processing is completed.
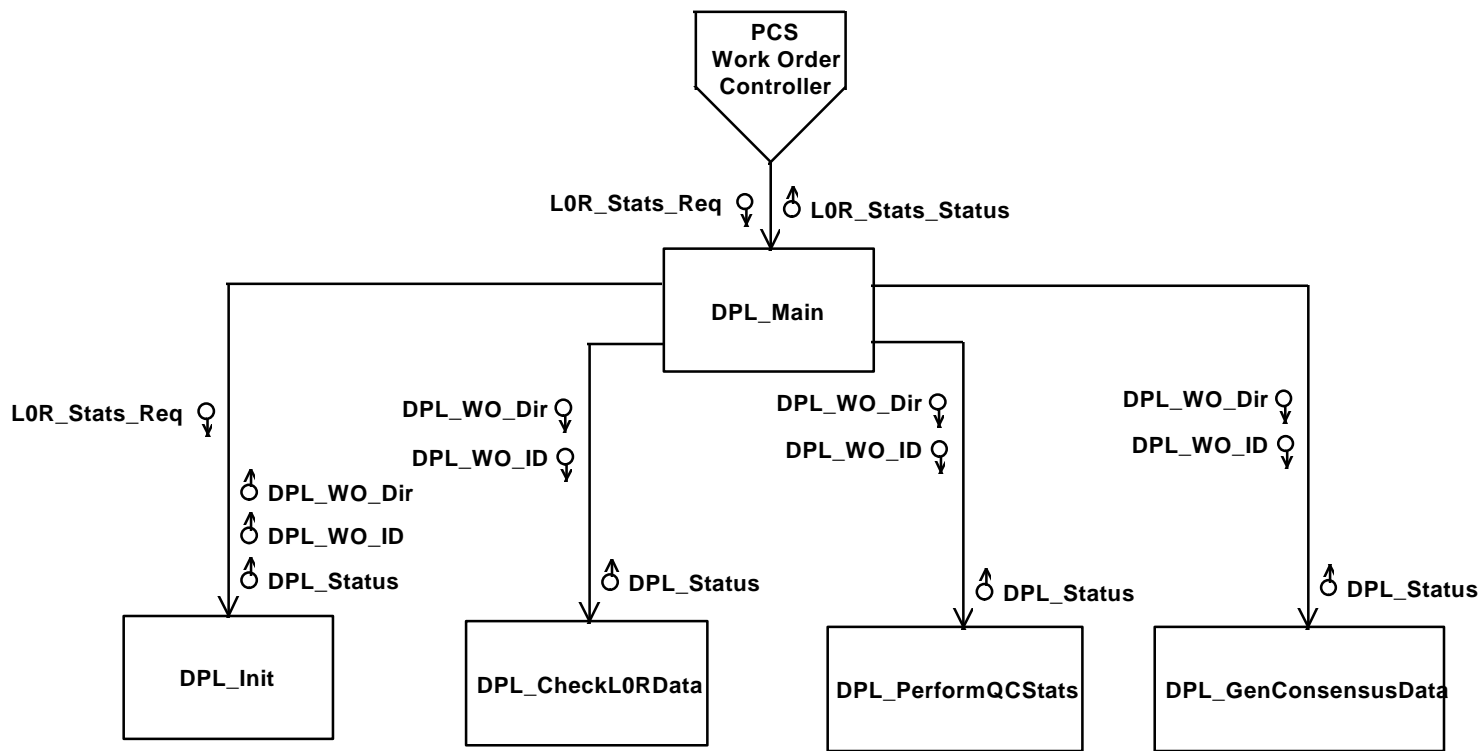
Figure 6–5. DPL Task Design

NAME: DPL_Init

TITLE: Task Initialization

BODY: Performs initialization for the task based on input parameters and configuration information in the database

NAME: DPL_CheckL0RData

TITLE: Perform Validation Checks

BODY: This unit is called to check the image files for completeness and adherence to criteria established for Level-1 processing.

NAME: DPL_PerformQCStats

TITLE: Generate Trending Data

BODY: This unit calculates trending data and statistics about the L0R image for use by IAS.

NAME: DPL_GenConsensusData

TITLE: Generate Consensus Files

BODY: This unit generates consensus files for PCD and MSCD based on the possible existence of multiple occurrences of each file type in the input image data files.

6.3.4 DMS Format L1 Product (DFL) Task

This subsection describes the DFL task software.

6.3.4.1 Task Overview

The DFL task is responsible for formatting and packaging the L1 product in preparation for delivery to ECS.

6.3.4.2 Initialization

The DFL task is started by the PCS Work Order Controller and connects to the database to retrieve configuration information for the requested L1 product. A signal handler which responds to UNIX system interrupts is created.

6.3.4.3 Normal Operation

DFL is invoked by the PCS Work Order Controller with L1_Format_Request parameters. After initialization, DFL formats the L1 product based on PCS calling parameters and the L1 work request attributes in the database. The L1 product contains L1R or L1G image data, metadata, quality information, and ancillary data, which gets packaged by default into HDF format. If specified by the user, DFL converts L1G images from the HDF format to either GeoTIFF or FAST format. It then moves the product to the designated staging area in preparation for delivery to ECS and returns processing status (L1_Format_Status) to PCS.

6.3.4.4 Error Handling

The DFL task establishes a signal handler to capture all fatal UNIX signals which would cause the task to abort. The signal handler will send an error message to the operator, disconnect from the database, and gracefully shutdown the task. Nonfatal errors are logged to the LPGS error log and an error notification is sent to the user interface.

6.3.4.5 Design

This subsection presents the design of the software component that implements the functions of the DFL task. The structure chart for the software is illustrated in Figure 6–6. DFL_Main is the main routine for the software process. The following sections describe the input, output, and primary modules for the DFL process.

Input

The input to the DFL task includes the following:

Data	Source	Purpose
L1_Format_Req	PCS	L1 product formatting and packaging parameters

Output

The output from the DFL task includes the following:

Data	Destination	Purpose
L1_Format_Status	PCS	L1 product formatting status

Primary Modules

The primary modules for the DFL task include the following:

NAME: DFL_Main

TITLE: Format and Pack L1 Product

BODY: DFL_Main controls the process sequence of DFL. DFL_Main is a script initiated by the PCS Work Order Controller. It calls DFL_Init to initialize the task using the script input parameters and the database work order and L1 product request information. After successfully locating the image and nonimage files, DFL_Main calls DFL_Form_L1 to format the L1G/L1R image data into HDF format. In the case that GeoTIFF or FAST format was requested for the L1G product, DFL_Main calls DFL_Conv_L1G to do the conversion. DFL_Main then calls DFL_Pack_L1 to package all associated image and nonimage data into an L1 product. The product is compared with the original L1 work request before moving it to the output staging area.

NAME: DFL_Init

TITLE: Initialize DFL task

BODY: DFL_Init connects to the database to retrieve LPGS configuration information associated with the requested work order. The original ECS L1 product request

PCS Work
Order
Controller

L1_Format_Req

L1_Format _Status

DFL_Main

L1_Format_Req

DFL_UF_L1_Image

DFL_HDF_L1G_Image

DFL_L1_Image
DFL_PCD
DFL_L1_Quality
DFL_Geo_Location
DFL_MSCD
DFL_L1_Meta
DFL_Prod_Req_Info
DFL_WO_Info

DFL_Prod_Req_Info

DFL_WO_Info

DFL_Status

DFL_HDF_L1_Image

DFL_Status

DFL_F_L1G_Image

DFL_Status

DFL_L1_Product

DFL_Status

DFL_Init

DFL_Form_L1

DFL_Conv_L1G

DFL_Pack_L1

Figure 6–6. DFL Task Design

parameters are retrieved from the database as well. DFL_Init then creates a signal handler for DFL to manage all UNIX system interrupts. Finally it retrieves information from the database on the intermediate files—their size, location, etc.

NAME: DFL_Form_L1

TITLE: Covert L1R/L1G Image Data to HDF Format

BODY: DFL_Form_L1 locates the L1 image product from the appropriate work order intermediate directory and uses a COTS product to transform the image data to the required HDF format.

NAME: DFL_Conv_L1G

TITLE: Convert L1G Image Data from HDF to GeoTIFF or FAST Format

BODY: DFL_Conv_L1G takes the L1G image output of DFL_Form_L1 and converts it to GeoTIFF or FAST format as per the work order request using a COTS product and tool kit. In case of errors, event/error log and status notifications are posted before aborting.

NAME: DFL_Pack_L1

TITLE: Pack L1 Image and Associated Non-Image Data into L1_Product

BODY: DFL_Pack_L1 locates the L1 image files and the associated data files from the work order input and intermediate directories. The required files include PCD data, MSCD data, geographic location data, IC data, CPF, and image quality data. The L1 product also consists of a metadata file, a representative description of the product, based on the work request and image characteristics from the database. The metadata file is in HDF format and is appended to the existing L0R metadata file. This unit packages the L1 product and moves the L1 product to the output staging area. Lastly, DFL_Pack_L1 checks the completeness of the L1 product with the work request specification. If an error occurs, event/error log and status notifications are posted before aborting.

6.3.5 DMS Xmit L1 Product (DXL) Task

This subsection describes the DXL task software.

6.3.5.1 Task Overview

This task is responsible for the transmission of the finished L1R/L1G products to ECS. The task is started by the LPGS Software Initialization task and runs continuously. PCS notifies this task of the L1 products that are ready for transfer to ECS. DXL sends an availability notice to ECS and ECS responds with a L1_Prod_Avail_Resp after they have the image data. The task activates upon receipt of a L1_Prod_Avail_Resp or L1_Prod_Xfer_Req message.

6.3.5.2 Initialization

The task is started by the LPGS Software Initialization task and accesses initialization data from the database for configuration.

6.3.5.3 Normal Operation

The DXL task is awakened by the receipt of a L1_Prod_Avail_Resp notification from DIE or a L1_Prod_Xfer_Req from PCS. When a L1_Prod_Xfer_Req is received from PCS, a L1_Prod_Avail_Notice is built and transmitted (through DIE) to ECS and information for this L1 product is added to an internal table. When a L1_Prod_Avail_Resp is received the internal table entry for the L1 product is removed; the Image files are marked for deletion; and the database is updated to reflect the successful transmission of the data to ECS. The task also activates on a timer, which ages the image data waiting for transfer.

6.3.5.4 Error Handling

The DXL task establishes a signal handler to capture all fatal UNIX signals which would cause the task to abort. The signal handler will send an error message to the operator, disconnect from the database, and gracefully shutdown the task. Nonfatal errors are logged to the LPGS error log and an error notification is sent to the user interface.

6.3.5.5 Design

This subsection presents the design of the software component that implements the functions of the DXL task. The structure chart for the software is illustrated in Figure 6–7. DXL_Main is the main routine for the software process. The following sections describe the input, output, and primary modules for the DXL process.

Input

The input to the DXL task includes the following:

Data	Source	Purpose
L1_Prod_Xfer_Req	PCS	Initiate transfer of L1 product to ECS
L1_Prod_Avail_Resp	DIE	Indicate product has been received by ECS

Output

The output from the DXL task includes the following:

Data	Destination	Purpose
L1_Prod_Avail_Notice	DIE	Tell ECS the L1 product is available for transfer
L1_Xmit_Info	DMS_PCS_IF_Information Data Store	Indicate product has been received by ECS

Primary Modules

The primary modules for the DXL task include the following:

NAME: DXL_Main

TITLE: Main Transmit Process

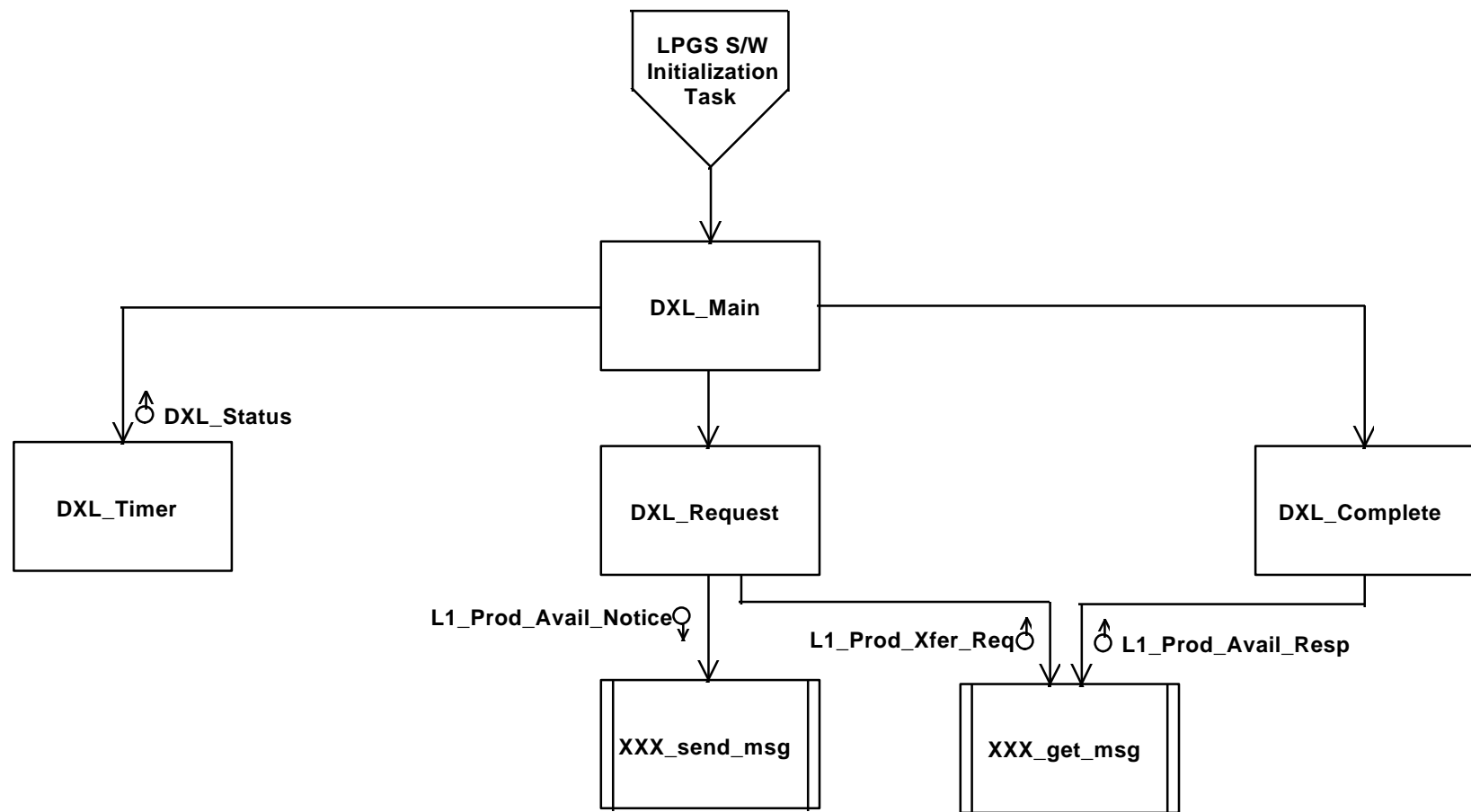**Figure 6–7. DXL Task Design**

BODY: This unit accesses the configuration information in the database and configures the task. A timer is set and the task processes the SELECT and determines the sequence of processing to manage the task functionality. DXL_Timer is called on timer expiration; DXL_Request is called upon receipt of data from PCS, and DXL_Complete is called upon receipt of data from DIE.

NAME: DXL_Timer

TITLE: Data aging checker

BODY: This task ages each entry in the table of Image files waiting transfer to ECS. Whenever an entry exceeds a threshold value an error is generated, the database is updated to reflect the status of transfer failed, and further action TBD.

NAME: DXL_Request

TITLE: Send availability notice

BODY: This unit, called upon receipt of data from PCS, gets the L1_Prod_Xfer_Req, formats the L1_Prod_Avail_Notice message, and transmits the message to ECS. The database is updated to reflect the status as transfer initiated.

NAME: DXL_Complete

TITLE: Transfer complete process

BODY: This unit, called upon receipt of data from DIE, gets the L1_Prod_Avail_Resp, marks the Image files for deletion, and removes the table entry for the Image transferred. The database is updated to reflect the status as transfer completed successfully.

6.3.6 DMS Resource Manager (DRM) Task

This subsection describes the DRM task software.

6.3.6.1 Task Overview

The DRM task manages the LPGS work order file system. The DRM task is started by the LPGS Software Initialization Task and will run as a background task. This task will periodically delete work order associated files and directories that have been marked for deletion. In addition, this task can receive operator requests to delete the work order associated data. After each deletion, the DRM task will update the database to indicate the files and directories are no longer available on the LPGS system. The DRM task will manage the files in the Image Processing Input, Intermediate, and Output directories.

6.3.6.2 Initialization

The DRM task is started by the LPGS Software Initialization Task. This tasks initialization includes connecting to the database, creating a signal handler, and retrieving configuration information from the database. Any errors encountered during initialization will result in the DRM task exiting.

6.3.6.3 Normal Operation

The DRM task will run when the timer expires or when an operator request is received. When the timer expires, DRM will clean up the disk and will check the disk usage. The DRM task will scan the WO in the database and will determine which WO files and directories can be deleted. This task will delete the files and directories and will update the database to indicate the files or directory were deleted. When the timer expires, this task will also determine the disk utilization, and it will alert the operator if the disk usage exceeds the desired amount (Threshold TBD). When an operator request is received, this task will immediately delete the file or directory. Then, this task will update the status in the database to indicate the deletion was performed because of the operator request.

6.3.6.4 Error Handling

The DRM task establishes a signal handler to capture all fatal UNIX signals which would cause the task to abort. The signal handler will send an error message to the operator, disconnect from the database, and gracefully shutdown the task. Nonfatal errors are logged to the LPGS error log and an error notification is sent to the user interface.

6.3.6.5 Design

This subsection presents the design of the software component that implements the functions of the DRM task. The structure chart for the software is illustrated in Figure 6–8. DRM_Main is the main routine for the software process. The following sections describe the input, output, and primary modules for the DRM process.

Input

The input to the DRM task includes the following:

Data	Source	Purpose
DMS_User_Input	Operator	Operator request to delete WO associated files or directories

Output

The output from the DRM task includes the following:

Data	Destination	Purpose
DMS_User_Output	Operator	Response to the operator requests

Primary Modules

The primary modules for the DRM task include the following:

NAME: DRM_Main

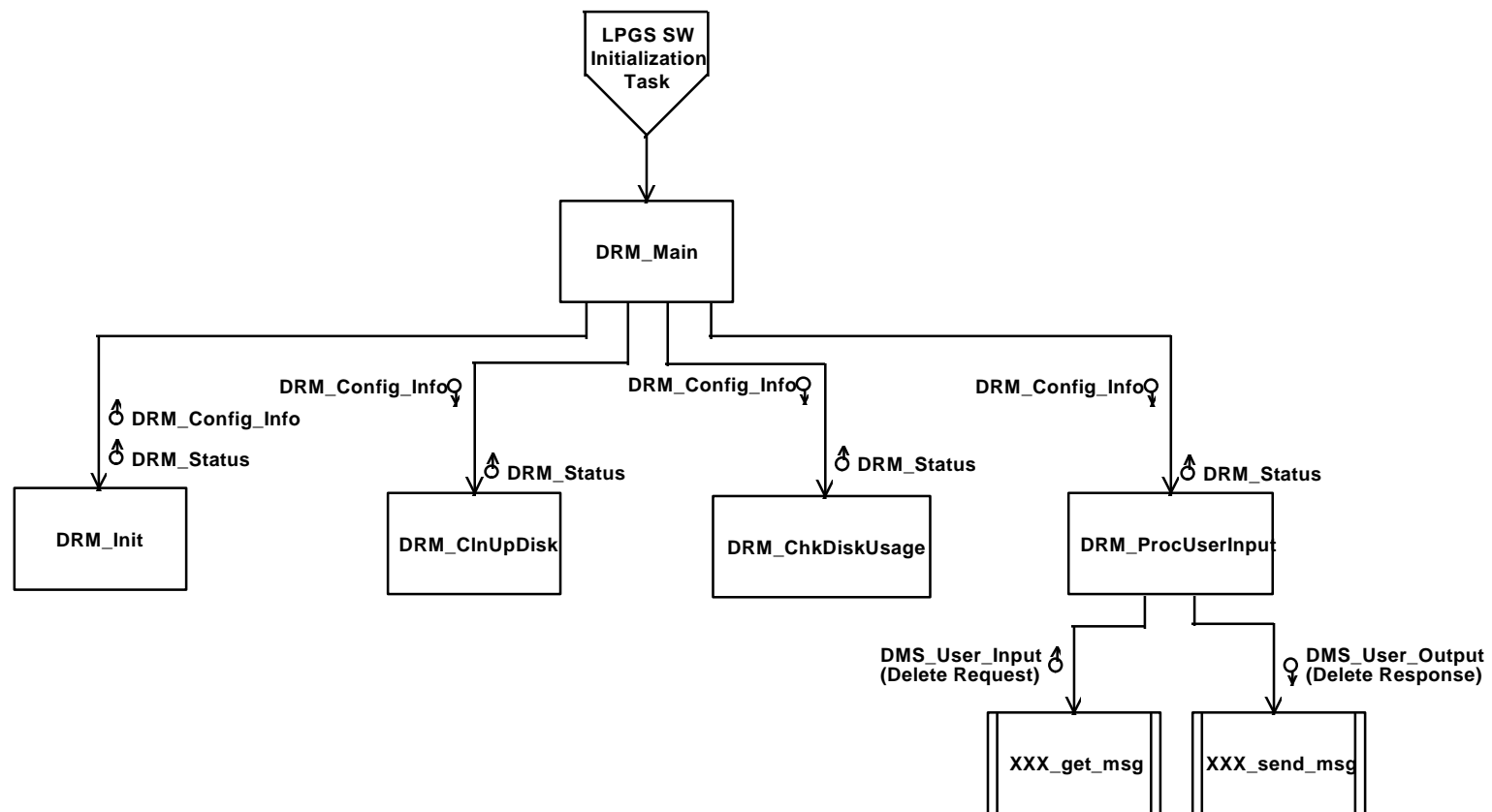TITLE: Main Resource Manager function

Figure 6–8. DRM Task Design

BODY: DRM_Main is the main function for the DMS Resource Manager process. This function calls the DRM_Init function to initialize the process. Then, this task will set a timer for the periodic disk clean up. The DRM_Main function will then wait for the timer to expire or for the receipt of a message from the operator. When the timer expires, this function will call the DRM_ClnUpDisk and then DRM_ChkDiskUsage. When this process receives an operator request, DRM_Main will call the DRM_ProcUserInput function to process the request.

NAME: DRM_Init

TITLE: DRM Initialization function

BODY: DRM_Init will connect to the database, create a signal handler, and retrieve configuration information from the database. This function will return the configuration information to the DRM_Main function.

NAME: DRM_ClnUpDisk

TITLE: DRM Clean up disk function

BODY: DRM_ClnUpDisk will query the database to determine which work order data and directories have been marked for deletion. Then, this function will delete the data and the directories associated with the work order. This function will update the database to indicate the data and directories were deleted.

NAME: DRM_ChkDiskUsage

TITLE: Check the Disk Usage

BODY: The DRM_ChkDiskUsage function will check the amount of available disk space. If the amount of disk space available is less than the specified threshold, an error message is logged to the LPGS error log and an error notification is sent to the user interface.

NAME: DRM_ProcUserInput

TITLE: DRM Process User Input function

BODY: DRM_ProcUserInput calls a LPGS system utility (XXX_get_msg) to get the operator request to delete data. Then, this function will query the database to determine the work order the data is associated with. Next, this process will delete the data and update the database to indicate the data has been deleted. Finally, this function will call a LPGS system utility (XXX_send_msg) to send the operator a response to the delete request.

6.3.7 DMS Generate Reports (DGR) Task

This subsection describes the DGR task software.

6.3.7.1 Task Overview

The DGR task generates the reports for the LPGS system. The DGR task is started by the LPGS Software Initialization task and will run as a background task. This task will periodically provide the IAS with characterization statistics. (Method and data are TBD.) In

addition, this task can receive operator requests to generate reports (TBD) or to provide IAS with the statistics.

6.3.7.2 Initialization

The DGR task is started by the LPGS Software Initialization task. The DGR task initialization includes connecting to the database, creating a signal handler, establishing an interface with IAS (TBD), and retrieving configuration information from the database. Any errors encountered during initialization will result in the DGR task exiting.

6.3.7.3 Normal Operation

The DGR task will run when the timer expires or when an operator request is received. When the timer expires, the DGR task will provide IAS with the characterization trending statistics which has not been previously provided. Only the statistics that are generated for full scenes are provided for IAS. The method for the transfer of the trending data is TBD. After IAS has received the statistics, this task updates the database to indicate the data has been provided. When an operator request is received, this task either provides the operator with the requested report (TBD) or provides IAS with the statistics.

6.3.7.4 Error Handling

The DGR task establishes a signal handler to capture all fatal UNIX signals which would cause the task to abort. The signal handler will send an error message to the operator, disconnect from the database, and gracefully shutdown the task. Nonfatal errors are logged to the LPGS error log and an error notification is sent to the user interface.

6.3.7.5 Design

This subsection presents the design of the software component that implements the functions of the DGR task. The structure chart for the software is illustrated in Figure 6–9. DGR_Main is the main routine for the software process. The following sections describe the input, output, and primary modules for the DGR process.

Input

The input to the DGR task includes the following:

Data	Source	Purpose
DMS_User_Input	Operator	Report generation request; Provide Char_Stats for IAS request

Output

The output from the DGR task includes the following:

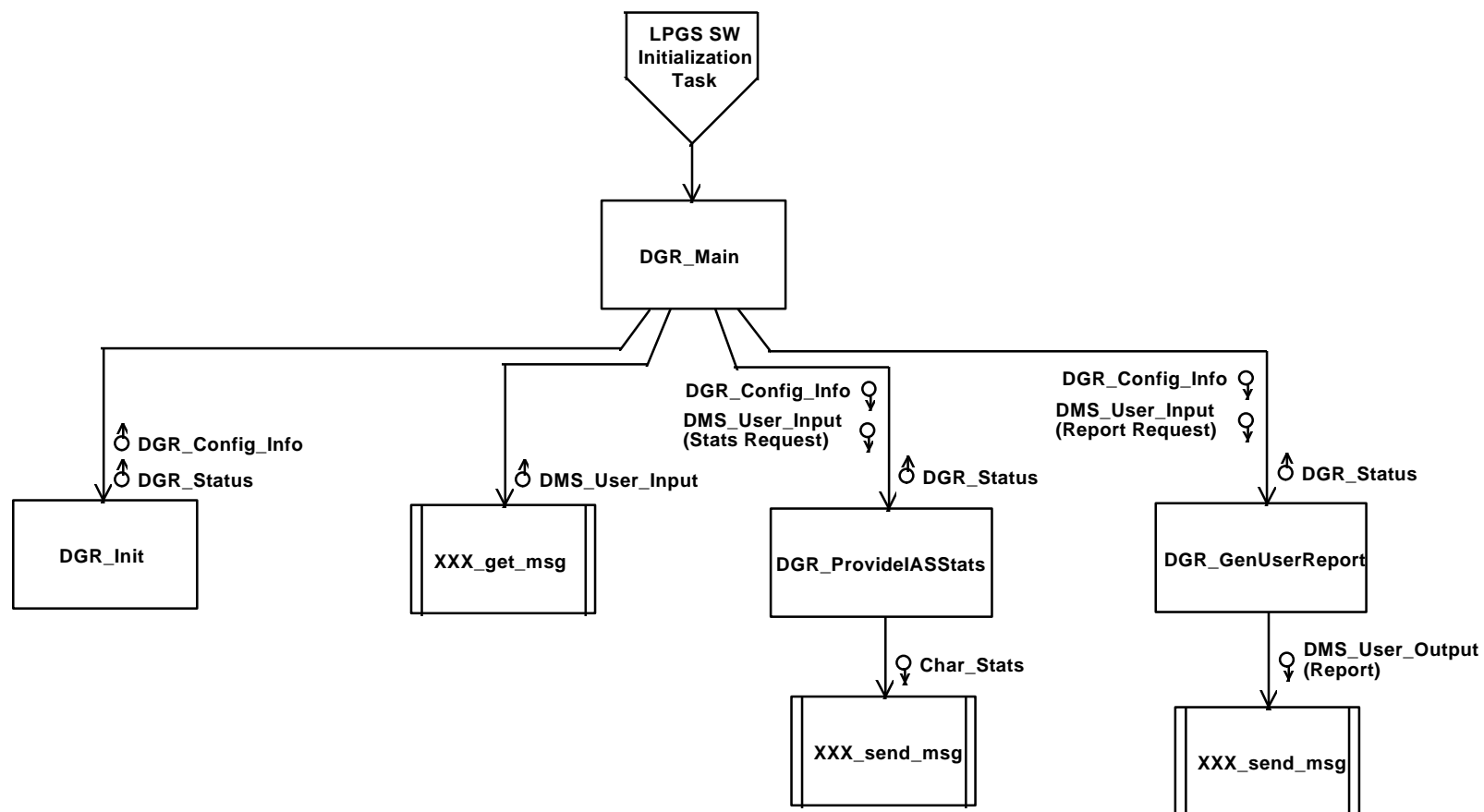| Data	Destination	Purpose
Char_Stats	IAS	Characterization statistics generated by LPGS
DMS_User_Output	GUI	Report information provided for the GUI

Figure 6–9. DGR Task Design

Primary Modules

The primary modules for the DGR task include the following:

NAME: DGR_Main

TITLE: Main Generate Report function

BODY: DGR_Main is the main function for the DMS Generate Report process. This function calls the DGR_Init function to initialize the process. Then, this task will set a timer for providing the characterization statistics to IAS. The DGR_Main function will then wait for the timer to expire or for the receipt of a message from the operator. When the timer expires, this function will call the DGR_ProvideIASStats function.   When   an operator request is received, DGR_Main will call the DGR_GenUserReport or DGR_ProvideIASStats to process the request.

NAME: DGR_Init

TITLE: DGR Initialization function

BODY: DGR_Init will connect to the database, create a signal handler, and retrieve configuration information from the database. This function will return the configuration information to the DGR_Main function.

NAME: DGR_ProvideIASStats

TITLE: DGR Provide IAS Characterization Statistics function

BODY: DGR_ProvideIASStats will provide IAS with the trending data in the LPGS database. The method for providing these statistics is TBD.

NAME: DGR_GenUserReport

TITLE: DGR Generate User Report function

BODY: DGR_GenUserReport function generates the operator requested report. This function will call a LPGS system utility (XXX_send_msg) to send the operator the report information.